

THE GEOLOGY OF SOUTH VICTORIA LAND.¹

THE National Antarctic Expedition is to be congratulated upon the care and promptitude with which its scientific collections are being worked out by the staff of the Natural History Museum. The results are being issued with the fulness of illustration and the excellent form characteristic of the publications of that institution. The work has been thoroughly supervised and edited. The first volume has a general preface by Sir Ray Lankester, and a special preface by Mr. Fletcher, in whose department the work of this volume was executed; the biological work is being edited by Mr. Jeffrey Bell. The first volume deals with the geological work of the expedition, and contains two reports. The first, by Mr. H. T. Ferrar, records his observations upon the stratigraphical and glacial geology. It is accompanied by a valuable geological map of the district around MacMurdo Sound, based on the topographical survey by Lieut. Mulock, and by an admirable series of photographs, that are a valuable supplement to the text, but by whom they were taken is not stated. The geological specimens obtained were mainly collected near the *Discovery's* winter quarters, and on the opposite part of the mainland. The extended field observations and the large amount of material collected are clearly the result of most indefatigable and courageous work, under difficult and dangerous conditions, and are a most important addition to Antarctic geology. The geological formations at MacMurdo Bay are divided by Mr. Ferrar into four series: the recent volcanic rocks of the islands; the gneiss and granite that form the foot hills and the basement of the mainland plateau; a wide series of horizontal sandstones, the Beacon Sandstones, that form the plateau of southern Victoria Land; and some dolerite sills intrusive into the Beacon Sandstones. Unfortunately there is no definite evidence as to the age of these sandstones. Some plant remains were found in them, and are described by Mr. Arber, according to whom they are "unfortunately of little value botanically"; he calls them "carbonaceous impressions," "which in all probability are of vegetable origin." Mr. Arber concludes that the specimens "neither permit of any opinion as to the botanical nature or affinities of the fossils themselves, nor of the geological age of the beds in which they occur." Considering the extent and abundant exposure of these sandstones, the apparent rarity of organic remains in them is significant. Mr. Ferrar devotes three chapters to glacial observations, and describes Ross's ice barrier as a Piedmont glacier, formed of confluent flows of land ice. The evidence offered in support of this conclusion is not very convincing, but until the issue of the meteorological data collected by the expedition, it is better to suspend judgment upon this question; and it may be hoped that Lieutenant Shackleton's expedition will collect further information as to the intimate structure of this ice.

The second part of the volume is occupied by Dr. Prior's report on the rocks of South Victoria Land. This report is masterly from its combination of refined petrographic research with insight into the tectonic bearings of the microscopic evidence. Dr. Prior shows

that the volcanic rocks include basalts, kenytes, phonolites and trachytic phonolites; the dykes are of camptonite, kersantite, and banakite; and the basement rocks of South Victoria Land include granite, diorite, gneiss and a crystalline limestone, of which a specimen was found by Dr. Wilson. Dr. Prior's report contains an interesting discussion of the chemical relations of the rocks and their interpretation by the American quantitative system of classification. He shows that the district is a distinct petrographic province characterised by the association of limburgites with intermediate rocks, which are rich in alkali and contain anorthoclase as the predominant feldspar. He has calculated the percentage mineral composition of the rocks and assigned to them the names they would receive in the American quantitative classification, and he concludes (p. 120) that "the result shows that the classification supplies a variety of names to rocks not differing very widely in chemical composition."

The sequence of the volcanic rocks is a question of



FIG. 1.—The two lower men are standing upon the upper surface of sea-ice depressed by snow below water-level. National Antarctic Expedition.

much interest, especially as some field observations were regarded as showing that the trachytes were younger than the basalts; but Dr. Prior concludes from his study of the rocks that this view is improbable, and that the trachytes and kenytes preceded the basalts, as they did in the typical kenyte area in East Africa. The most widely interesting part of Dr. Prior's report is probably that discussing the geographical relations of South Victoria Land. He points out that the rocks are chemically allied to those of the Atlantic coast type, and not to those of the Pacific coast type. He, of course, recognises that, according to this use of the terms Atlantic and Pacific, the southern end of New Zealand must be regarded as of the Atlantic type, for the rocks of South Victoria Land are petrographically allied to those of Dunedin described by Dr. Marshall. An article in *NATURE* (in 1901, vol. lxi., p. 610) on the probable geological relations of Victoria Land pointed out that the sudden change in the geographical grain of southern New Zealand might very likely be continued into Ant-

¹ National Antarctic Expedition, 1901-1904. *Natural History*, vol. i. *Geology* (Field-Geology; Petrography). Pp. xii+160; 10 plates and 2 maps. (By order of the Trustees of the British Museum, 1907.) Price 30s.

arctica, and that accordingly the view suggested by Reiter that the mountains of South Victoria Land were the continuation of the mountain chain of New Zealand might require modification. The geological results issued in this volume show that, as expected, South Victoria Land is a high plateau broken off to the east by the subsidences which have formed the Ross Sea. Moreover, the suspected affinities between Victoria Land and New Zealand have been greatly strengthened by the discovery of the kenyte series of Ross Island; and the predictions in *NATURE* (vol. lxi., p. 610) that "the palæontological results may be meagre" has proved only too true. Reiter's theory, however, requires one modification. The earlier descriptions of Victoria Land asserted the volcanic nature of the mountains on the plateau of South Victoria Land (as, e.g., is the case in Mexico

rocks of the Pacific type, and subsidences those of the Atlantic type, is no real explanation; and though the coincidence is certainly widespread, it does not appear to be universal. The chemical character of the volcanic rocks can only be used as a test of the tectonic structure of coasts with important limitations; and the coastal types may still be regarded as based essentially on geographical structure, and not on the chemical composition of their lavas.

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NAVIGATION OF THE AIR.¹

THE author of this work at the outset states that he has no intention of writing a technical textbook, and his treatment of the subject, which embraces aerial navigation generally, is distinctly of a

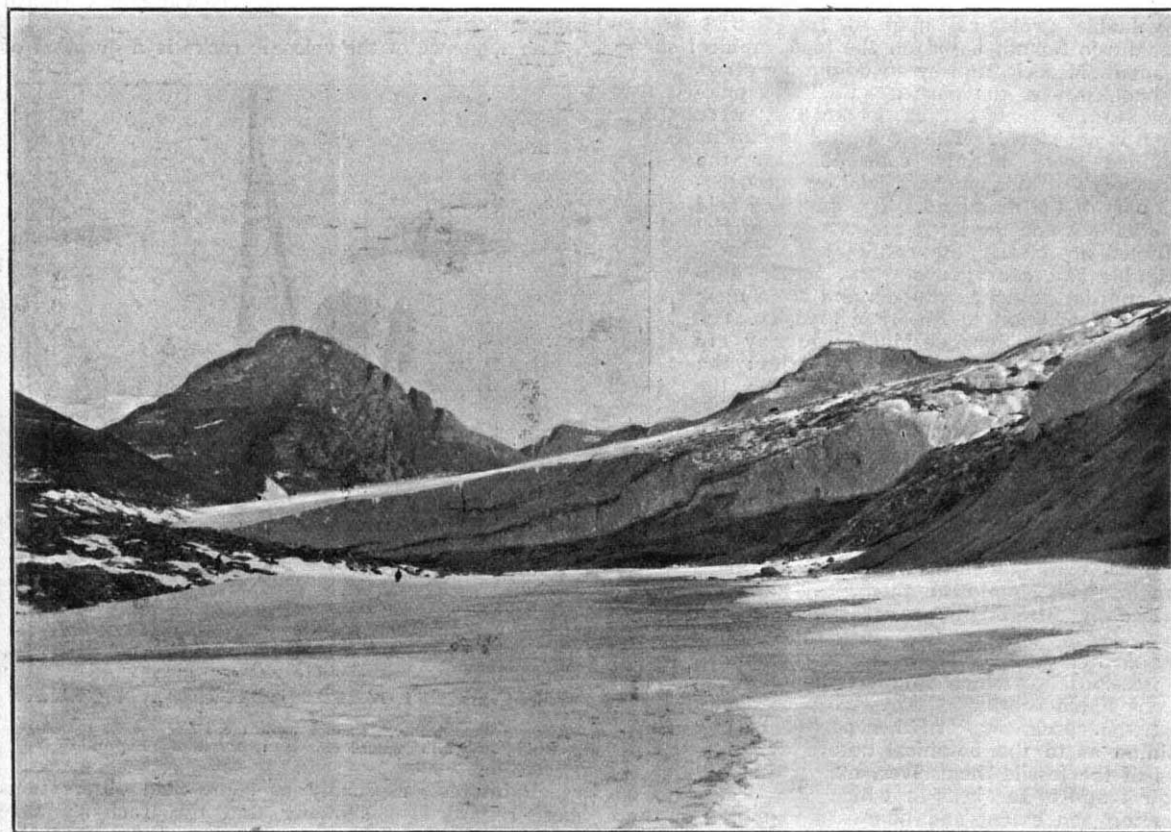


FIG. 2.—Uplift of morainic material in the ice at the foot of Knob Head. National Antarctic Expedition.

and parts of the Andes), whereas the volcanoes, at least in the area reached by the expedition, were limited to the founded area in front of the plateau, as is the case in eastern Asia. Accordingly the structure of South Victoria Land may be of the inner or secondary Pacific type, and any remains of an outer or primary Pacific coast connecting New Zealand and Graham Land may be expected further to the east. The evidence is not yet sufficient for a final opinion, and an alternative interpretation, in deference to the petrographic evidence, is to regard the coast of South Victoria Land as of the Atlantic type; but there does not seem any clear reason why the distribution of volcanic rocks of different chemical types should be controlled by the nature of the crustal movements. The suggestion that fold movements produce volcanic

popular kind. Portions of the work, for example, those relating to ballooning and balloon photography, are dealt with in great detail, and show an intimate practical acquaintance with the subject; the section also relating to carrier pigeons, both in connection with ballooning and otherwise, is a welcome addition to the literature of the homing pigeon. On the other hand, some portions of the work are scarcely satisfactory, even from the popular standpoint, the chapter devoted to flying machines, for example, being a collection of scraps of information strung together without any definite scheme; on the face of it, this chapter is intended to be arranged in historical order, but

¹ "Airships Past and Present, together with Chapters on the Use of Balloons in Connection with Meteorology, Photography, and the Carrier Pigeon." By A. Hildebrandt. Translated by W. H. Story. Pp. xvi+364. (London: A. Constable and Co., Ltd., 1908.) Price 10s. 6d. net.